Product Specification

Customer: _____

Model Name: BR070JIE2135-A3   V.11_____

Date:_____ 2021.04.26_____

Version:_____1.0_____

■ **Preliminary Specification**

☐ **Final Specification**

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

Contents

1. Record of Revision

Version	Revise Date	Content	Editor
1.0	2021/04/26	First Release.	

2 General Specifications

Feature		Spec
Characteristics	LCD Size	7.0 inch
	Display Format	1024 (RGB) × 600
	Interface	RGB
	Color Depth	16.7M
	Technology type	a-Si
	Display Spec.	-
	Display Mode	Normally White
	Driver IC	EK79007+EK73215
	Surface Treatment	-
	Viewing Direction	12:00
	Gray Viewing Direction	6:00
Mechanical	LCM (W x H x D) (mm)	164.9*100.0*3.5
	Active Area(mm)	154.21*85.92
	With /Without TSP	Without TP
	Weight (g)	TBD
	LED Numbers	21 LEDs

Note 1: Viewing direction is following the data which measured by optics equipment.

Note 2: Requirements on Environmental Protection: RoHS

Note 3: LCM weight tolerance: +/- 5%

3 Input/Output Terminals

Pin No	Symbol	I/O	Function	
1	LED-	P	Power for LED backlight (Cathode)	
2	LED-	P	Power for LED backlight (Cathode)	
3	LED+	P	Power for LED backlight (Anode)	
4	LED+	P	Power for LED backlight (Anode)	
5	VCOMIN	P	VCOM buffer in.	
6	AVDD	P	Power supply for analog circuit.	
7	VDD	P	Power supply for digital circuit.	
8	VDD	P	Power supply for digital circuit.	
9	UPDN	I	Gate driver up/down scan setting. Normally pull low UPDN=L: normal scan. STV2 output vertical start pulse and UD pin output "L" at gate driver at right side. (Default) UPDN=H: reverse scan. STV1 output vertical start pulse and UD pin output "H" at gate driver at right side.	
10	SHLR	I	Source driver Right or Left sequence control: Normally pull high SHLR=L: SO1536_ SO1535_ SO1534_•••_SO1. SHLR=H: SO1_ SO2_ SO3_•••_SO1536. (Default)	
11	RST	I	Global reset pin.	
12	STBYB	I	Standby mode control. Normally pull high STBYB=L: TCON and source driver are off and all source outputs keep low level. STBYB=H: Normal operation. (Default)	
13	GND	P	Ground	
14	MIPI_0-	I	Data input	
15	MIPI_0+	I	Data input	
16	GND	P	Ground	
17	MIPI_1-	I	Data input	
18	MIPI_1+	I	Data input	
19	GND	P	Ground	
20	CLKN	I	Clock Input.	
21	CLKP	I	Clock Input.	
22	GND	P	Ground	
23	MIPI_2-	I	Data input	
24	MIPI_2+	I	Data input	
25	GND	P	Ground	
26	MIPI_3-	I	Data input	
27	MIPI_3+	I	Data input	
28	GND	P	Ground	
29	VGH	P	Gate ON Voltage	
30	VGL	P	Gate OFF Voltage	

I: input, O: output,   P: Power

4 Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V_{dd}	-0.3	+2.0	V	
Analog Supply Voltage, AVDD	V_{AVDD}	-0.3	+15.0	V	
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

5 Electrical Characteristics

5.1 Operating conditions:

(TA = 25° C, GND = AGND = 0V)

Parameter	Symbol	Min	Typ.	Max	Unit	Remark
Power Voltage	VDD	1.71	1.8	1.89	V	
	AVDD	10.0	10.45	10.8	V	
	VCOM	3.0	3.60	4.20	V	3
	VGH	14.5	15.0	115.5	V	1
	VGL	−10.5	−10.0	−9.5	V	2
Input logic high voltage	V_{IH}	0.8VDD	-	VDD	V	
Input logic low voltage	V_{IL}	0	-	0.2VDD	V	

Note:

*1. VGH is TFT Gate operating Voltage.

*2. VGL is TFT Gate operating Voltage.

  The storage structure of this model is C_{ST} (Storage on Common)

*3. Vcom must be adjusted to optimize display quality Crosstalk, Contrast Ratio and etc.

5.2 Driving Backlight

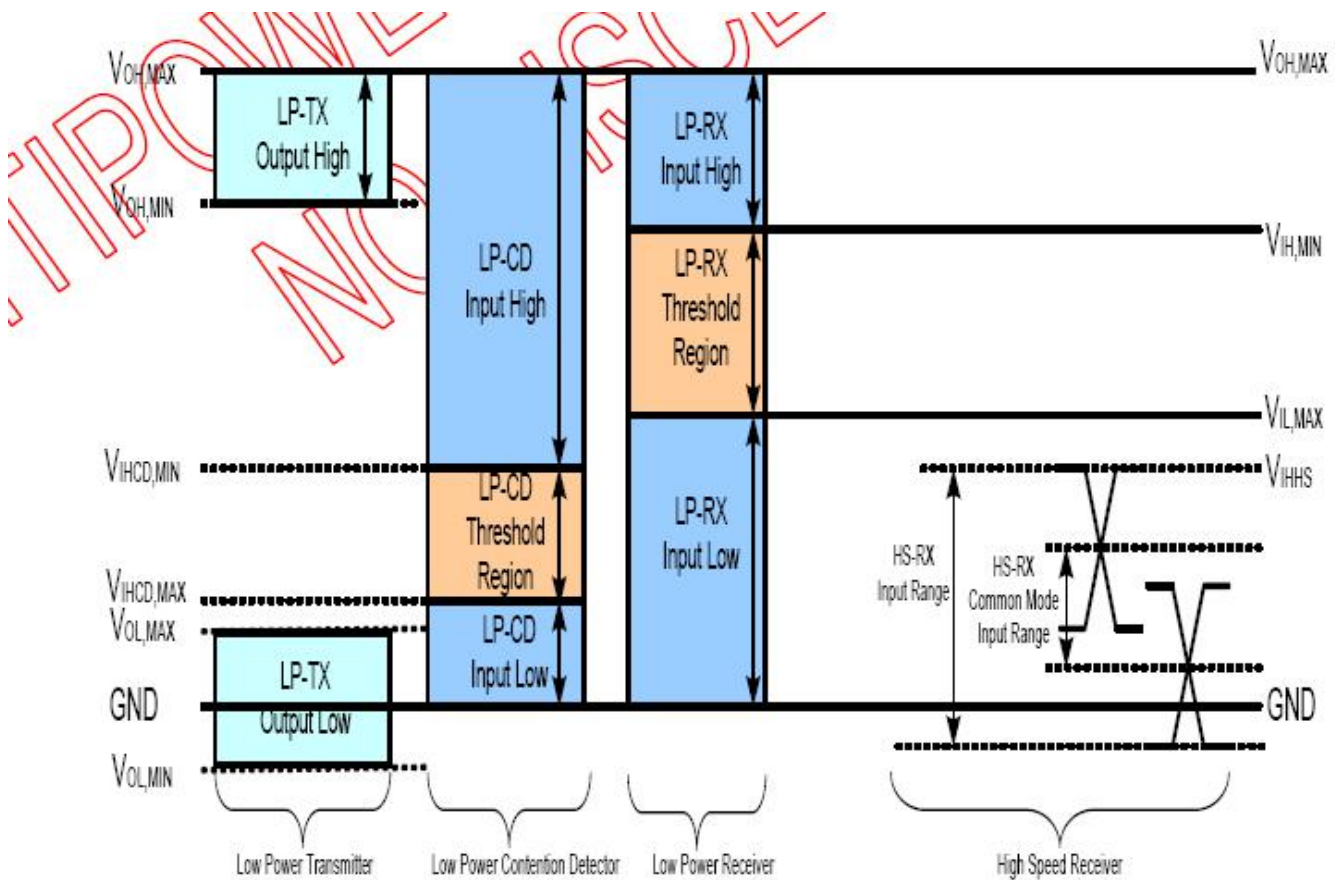| Item	Symbol	MIN	TYP	MAX	Unit	Remark
LED current	I_F	130	140	175	mA	
Power Consumption					mW	
LED Voltage	V_F	8.4	8.7	9.6	V	Note 1
LED Life Time	W_{BL}	-	30000	-	Hr	Note 2,3

Note 1 : There are 3Groups*7=21   LED

Note 2 : Ta = 25℃

Note 3 : Brightess to be decreased to 50% of the initial value

6 Interface Timing

6.1 MIPI Interface DC Characteristic

Parameter	Symbol	Min.	Typ.	Max.	Unit
MIPI Characteristics for High Speed Receiver					
Single-ended input low voltage	V_{ILHS}	-40	-	-	mV
Single-ended input high voltage	V_{IHHS}	-	-	460	mV
Common-mode voltage	V_{CDRXDC}	70	-	330	mV
Differential input impedance	Z_{ID}		100		ohm
HS transmit differential voltage(VOD=VDP-VDN)	$|V_{OD}|$	140	200	250	mV
MIPI Characteristics for Low Power Mode					
Pad signal voltage range	V_I	-50	-	1350	mV
Ground shift	V_{GNDSH}	-50	-	50	mV
Logic 0 input threshold	V_{IL}	0	-	550	mV
Logic 1 input threshold	V_{IH}	880	-	1350	mV
Input hysteresis	V_{HYST}	25	-	-	mV
Output low level	V_{OL}	-50	-	50	mV
Output high level	V_{OH}	1.1	1.2	1.3	V
Output impedance of Low Power Transmitter	Z_{OLP}	80	100	125	ohm
Logic 0 contention threshold	$V_{ILCD,MAX}$	-	-	200	mV
Logic 0 contention threshold	$V_{IHCD,MIN}$	450	-	-	mV

## 6.2 MIPI AC Characteristic

6.2.1 LP Transmitter AC Specification

Parameter		Symbol	Min	Typ	Max	Units	Notes
15%~85% rising time and falling time		T_{RLP} /T_{FLP}	-	-	25	ns	-
30%~85% rising time and falling time		T_{REOT}	-	-	35	ns	-
Pulse width of LP exclusive-OR clock	First LP EXOR clock pulse after STOP state or Last pulse before stop state	$T_{LP-PULSE-TX}$	40	-	-	ns	-
	All other pulses		20	-	-	ns	-
Period of the LP EXOR clock		$T_{LP-PER-TX}$	90	-	-	mV/ns	-
Slew Rate @C_{LOAD} =0pF		δ V/δ t_{SR}	30	-	500	mV/ns	-
Slew Rate @C_{LOAD} =5pF			30	-	200	mV/ns	-
Slew Rate @C_{LOAD} =20pF			30	-	150	mV/ns	-
Slew Rate @C_{LOAD} =70pF			30	-	100	mV/ns	-
Load Capacitance		T_{RLP}	-	-	70	pF	-
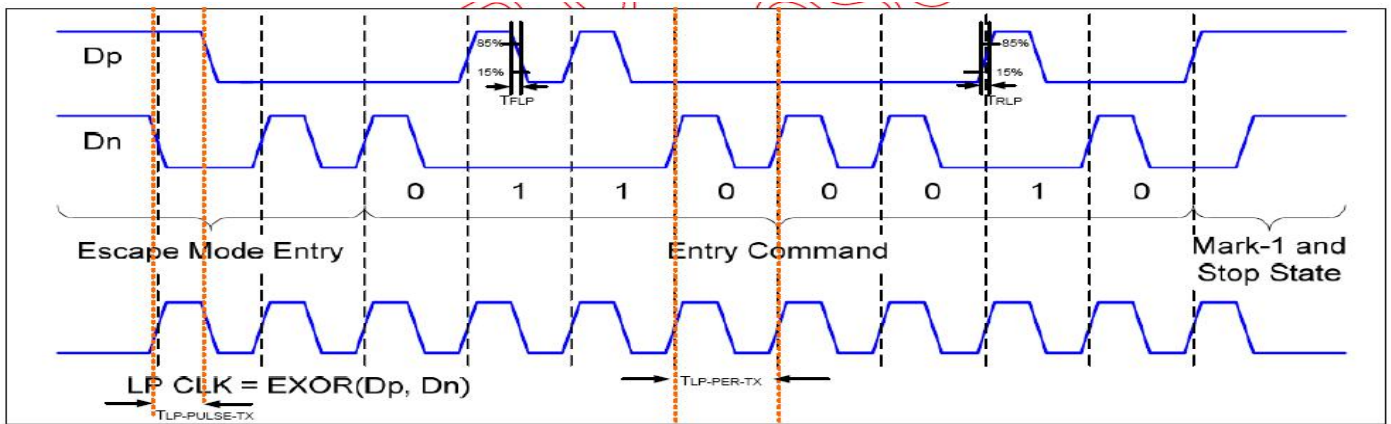
6.2.2 Turnaround Procedure

Turnaround Procedure Operation Timing Parameters

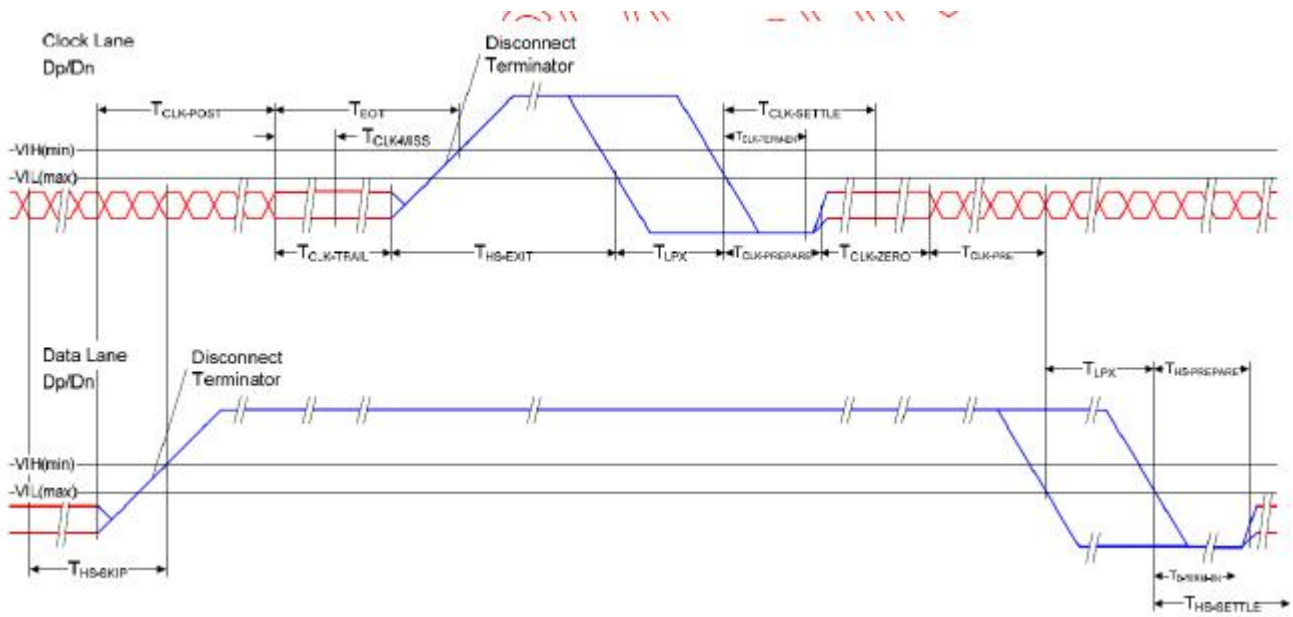| Parameter	Symbol	Min	Typ	Max	Units
Length of any Low-Power state period: Master side	T_{LPX}	50	-	75	ns
Length of any Low-Power state period: Slave side	T_{LPX}	50	55.56	58.34	ns
Ratio of T_{LPX}(Master)/ T_{LPX} (Slave) between Master and Slave side	Ratio T_{LPX}	2/3	-	3/2	
Time-out before new TX side start driving	$T_{TA-Sure}$	T_{LPX}	-	$2T_{LPX}$	ns
Time to drive LP-00 by new TX	T_{TA-GET}	-	$5T_{LPX}$	-	ns
Time to drive LP-00 after Turnaround Request	T_{TA-GO}	-	$4T_{LPX}$	-	ns
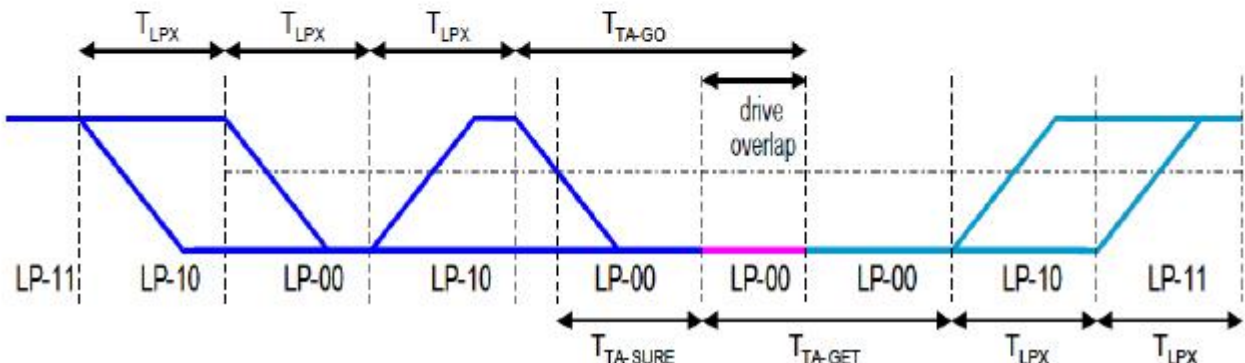
6.2.3 High speed transmission

Parameter	Symbol	Min	Typ	Max	Units
UI instantaneous	UI_{INST}	2	-	12.5	ns
Data to Clock Skew(measured at transmitter)	$T_{SKEW(TX)}$	-0.15	-	0.15	UI_{INST}
Data to Clock Setup time(measured at receiver)	$T_{SETUP(RX)}$	0.15	-	-	UI_{INST}
Data to Clock Hold time(measured at receiver)	$T_{HOLD(RX)}$	0.15	-	-	UI_{INST}
20%~80% rise time and fall time	T_R, T_F	150	-		ps
		-	-	0.3	UI_{INST}
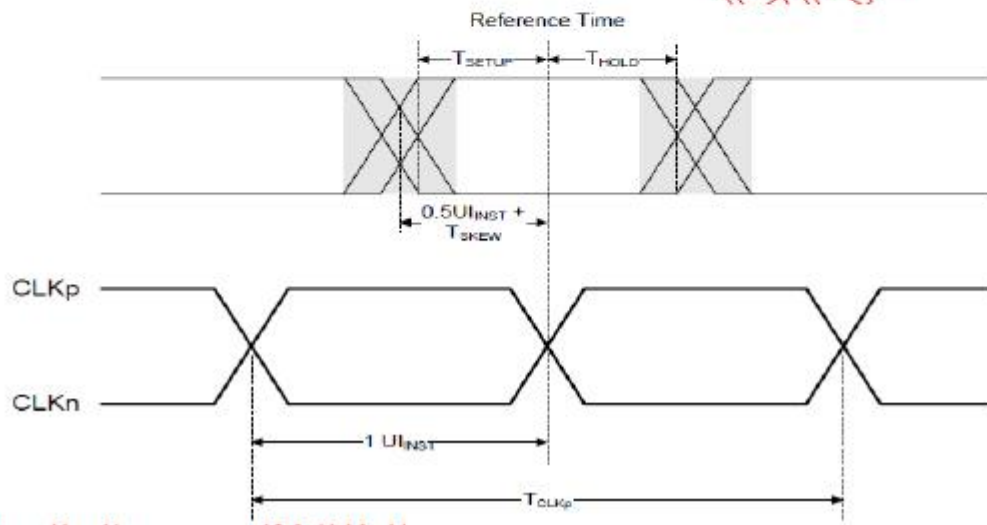
6.2.4 High Speed Clock Transmission

| Parameter	Symbol	Min	Typ	Max	Units
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	$T_{CLK-POST}$	60+52UI	-	-	ns
Detection time that the clock has stopped toggling	$T_{CLK-MISS}$	-	-	60	ns
Time to drive LP-00 to prepare for HS clock transmission	$T_{CLK-PREPARE}$	38	-	95	ns
Minimum lead HS-0 drive period before starting clock	$T_{CLK-PREPARE} + T_{CLK-ZERO}$	300	-	-	ns
Time to enable Clock Lane receiver line termination measured from when Dn cross $V_{IL,MAX}$	$T_{HS-TERM-EN}$	-	-	38	ns
Minimum time that the HS clock must be prior to any associated data lane beginning the transmission from LP to HS mode	$T_{CLK-PRE}$	8	-	-	UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	$T_{CLK-TRAIL}$	60	-	-	ns

6.2.5 High Speed Data Transmission in Bursts
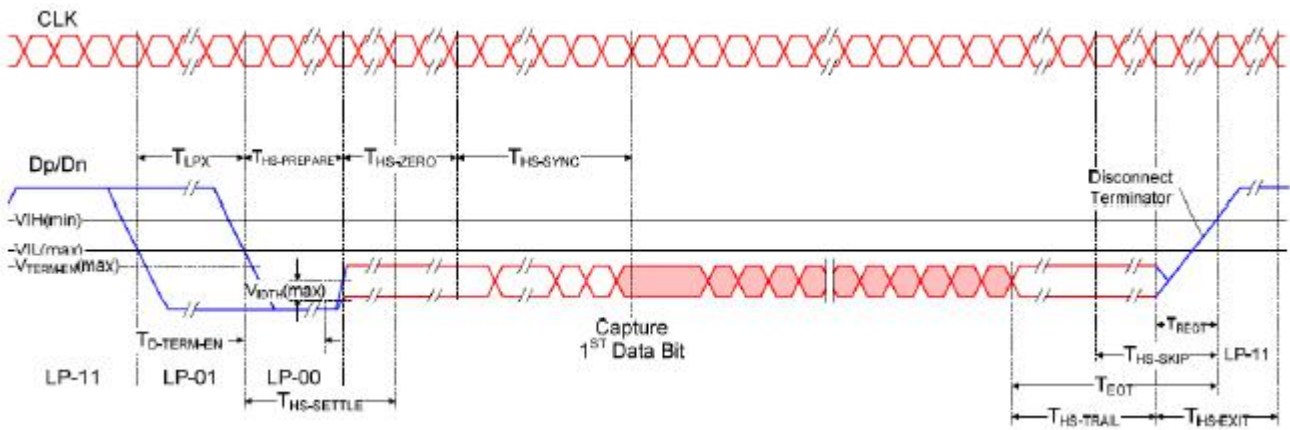
6.3 Reset Timing:

VDD/GRB AC characteristic

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
VDD power slew rate	T_{POR}	-	-	20	ms	From 0 to 90% VDD
GRB active pulse width	T_{GRB}	1	-	-	ms	VDD=VDD_IF= 1.8V
VDD resettle time	T_{RES}	1	-	-	s	
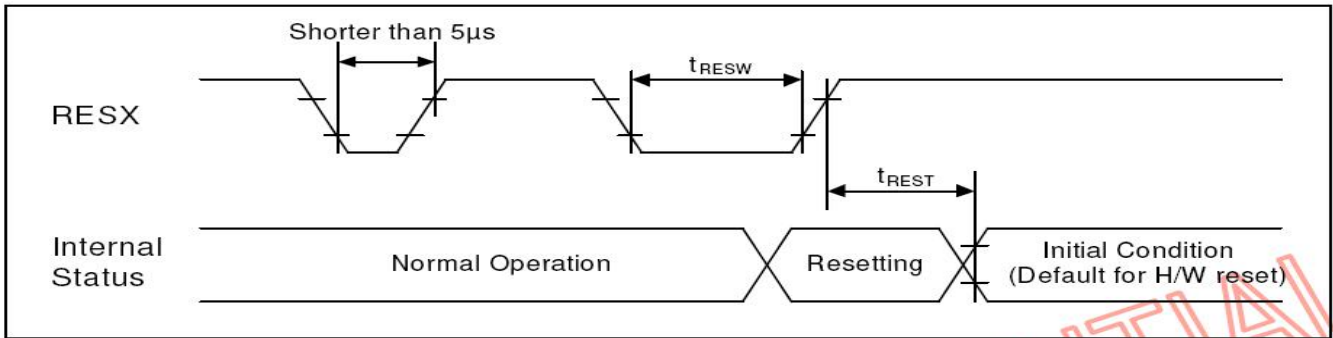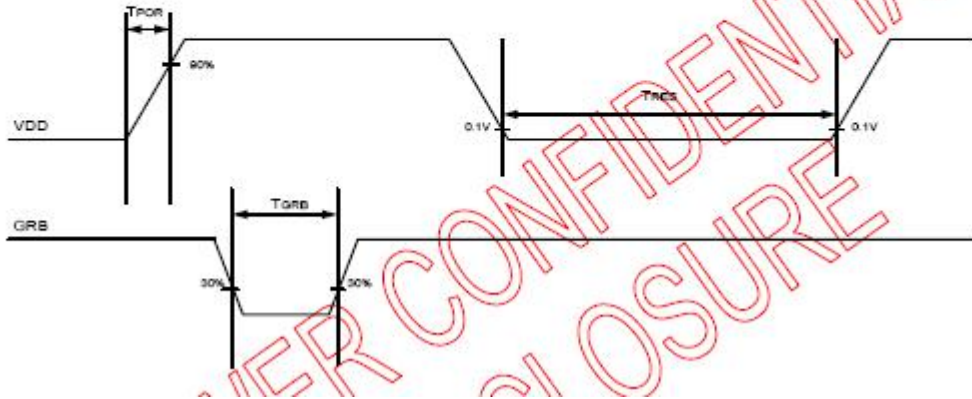
7 Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angles		θ_T	Center CR≥10	60	70	-	Degree.	Note2
		θ_B		65	75	-		
		θ_L		65	75	-		
		θ_R		65	75	-		
Contrast Ratio		CR	Θ =0	600	800	-	-	Note1, Note3
Response Time		T_{ON}	25°C	-	13	20	ms	Note1, Note4
		T_{OFF}		-	15	25		
Chromaticity	White	X_W	Backlight is on		TBD		-	Note1, Note5
		Y_W			TBD		-	
	Red	X_R			TBD		-	
		Y_R			TBD		-	
	Green	X_G			TBD		-	
		Y_G			TBD		-	
	Blue	X_B			TBD		-	
		Y_B			TBD		-	
Uniformity		U		70	-	-	%	Note1, Note6
NTSC					50		%	Note5
Luminance		L		250	300			Note1, Note7

Test Conditions:

1. IF= 20mA(one channel),the ambient temperature is 25°C.

2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

Item	Photo detector	Field
Contrast Ratio	BM-7A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	SR-3A	2°
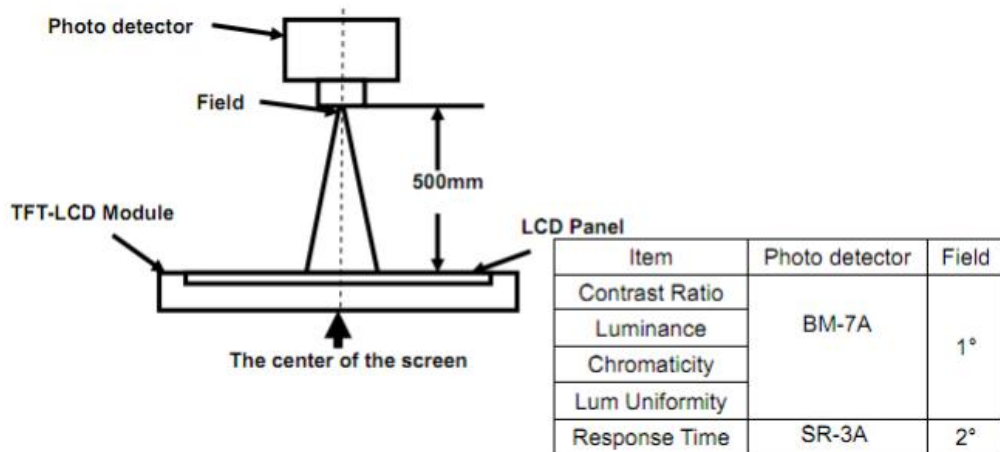
Note 2: Definition of viewing angle range and measurement system.
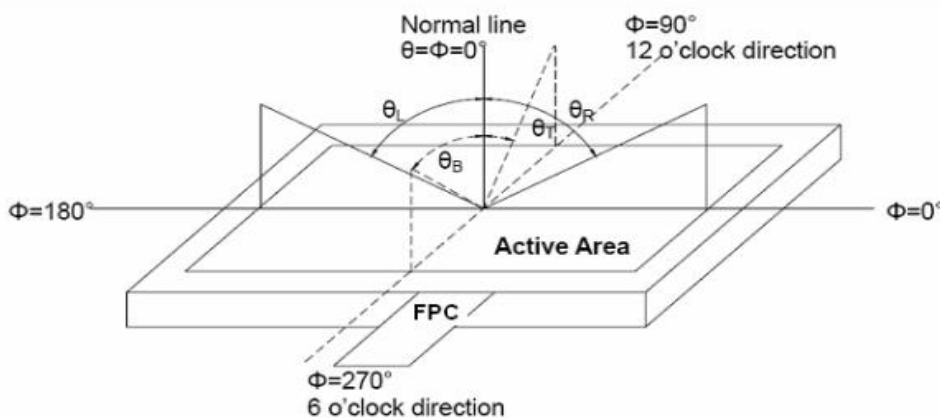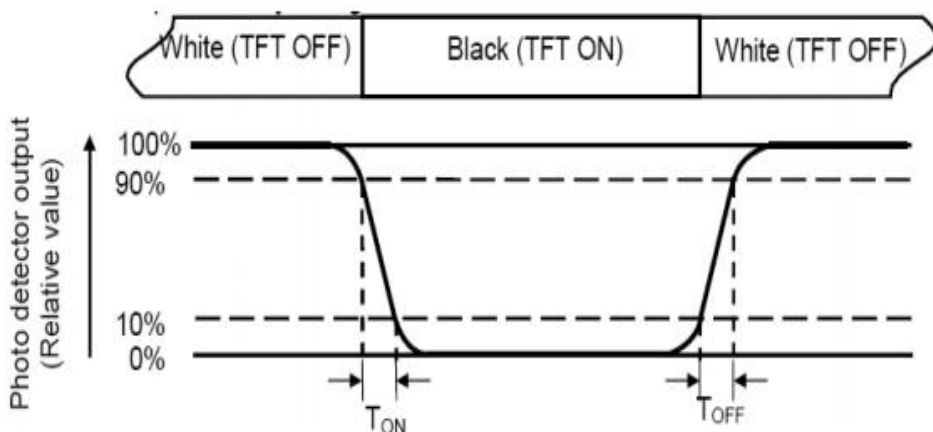Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).

Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note 4: Definition of Response time
    The response time is defined as the LCD optical switching time interval
    Between "White" state and "Black" state.   Rise time (TON) is the time between
    Photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is
    The time between photo detector output intensity changed from 10% to 90%

Note 5: Definition of color chromaticity (CIE1931)

   Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the Center of each measuring area

Luminance Uniformity (U) = Lmin/ Lmax X100%
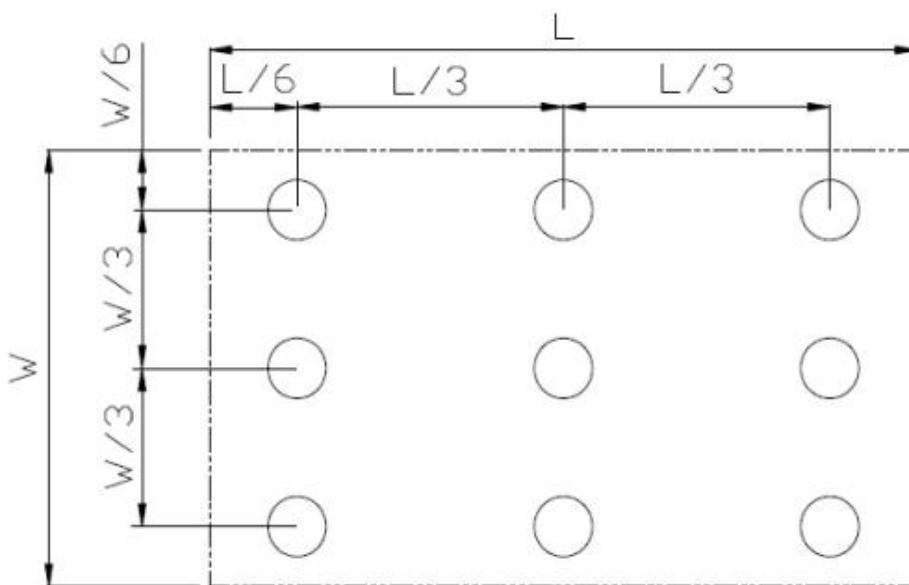
L-------Active area length W----- Active area width

Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

8 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +70℃，96hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -20℃，96hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +80℃，96hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30℃，96hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max，96 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30℃ 30 min ~ +80℃ 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 60 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note: 1. T_S is the temperature of panel's surface.

    2. Ta is the ambient temperature of sample.

9   Mechanical Drawing

1 0.Packing

TBD

11. Precautions for Use of LCD modules

11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- ― Isopropyl alcohol
- ― Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

Water ； Ketene ； Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

11.1.7. If the logic circuit power is off, do not apply the input signals.

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

11.2 Storage Precautions

11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range If the LCD modules will be stored   for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃   Relatively humidity: ≤80%

11.2.3.   The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.